



Temperature, temperature extremes, and mortality: A study of acclimatisation and effect modification in 50 US cities

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Abstract:

Objectives: The authors examined the increase in mortality associated with hot and cold temperature in different locations, the determinants of the variability in effect estimates, and its implications for adaptation. **Methods:** The authors conducted a case-crossover study in 50 US cities. They used daily mortality and weather data for 6 513 330 deaths occurring during 1989-2000. Exposure was assessed using two approaches. First, the authors determined exposure to extreme temperatures using city-specific indicator variables based on the local temperature distribution. Secondly, they used piecewise linear variables to assess exposure to temperature on a continuous scale above/below a threshold. Effects of hot and cold temperature were examined in season-specific models. In a meta-analysis of the city-specific results, the authors examined several city characteristics as effect modifiers. **Results:** Mortality increases associated with both extreme cold (2-day cumulative increase 1.59% (95% CI 0.56 to 2.63)) and extreme heat (5.74% (95% CI 3.38 to 8.15)) were found, the former being especially marked for myocardial infarction and cardiac arrest deaths. The increase in mortality was less marked at less extreme temperatures. The effect of extreme cold (defined as a percentile) was homogeneous across cities with different climates, suggesting that only the unusualness of the cold temperature (and not its absolute value) had a substantial impact on mortality (that is, acclimatisation to cold). Conversely, heat effects were quite heterogeneous, with the largest effects observed in cities with milder summers, less air conditioning and higher population density. Adjustment for ozone led to similar results, but some residual confounding could be present due to other uncontrolled pollutants. **Conclusions:** The authors confirmed in a large sample of cities that both cold and hot temperatures increase mortality risk. These findings suggest that increases in heat-related mortality due to global warming are unlikely to be compensated for by decreases in cold-related mortality and that population acclimatisation to heat is still incomplete.

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Resource Description

Communication: ☒

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☒

audience to whom the resource is directed

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Policymaker

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Cold, Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Injury

Cardiovascular Effect: Heart Attack

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Low Socioeconomic Status

Resource Type:

format or standard characteristic of resource

Research Article

Resilience:

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale:

time period studied

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Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content